

# Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <a href="http://about.jstor.org/participate-jstor/individuals/early-journal-content">http://about.jstor.org/participate-jstor/individuals/early-journal-content</a>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

# HARPER'S READEI

								Pages.	Introduction Price.	List Price.
HARPER'S First Reader	-	-		-		-		144	20cts.	24cts.
HARPER'S Second Reader		-	-		-		-	208	30 ''	36 ''
HARPER'S Third Reader	-	-		-		-		316	40 ''	48 ''
HARPER'S Fourth Reader		-	-				-	420	50 ''	60 ''
HARPER'S Fifth Reader	-	-		-		-		. [	In Preparation.	]

Although published less than six months ago Harper's Readers have already been adopted and are now in satisfactory use in

### MORE THAN FIVE HUNDRED CITIES AND TOWNS

including NEW YORK CITY, PHILADELPHIA, JERSEY CITY, N.J., FALL RIVER, MASS., ITHACA, N.Y., JACKSON, MICH., ELGIN, ILL., PATERSON, N.J., and many other places of importance. They have been adopted by the Board of Education of

## THE STATE OF SOUTH CAROLINA

for use in the schools of that state, and have received the official sanction of officers and school boards in

## HUNDREDS OF COUNTIES AND COUNTRY DISTRICTS.

in all parts of the Union. They have also been adopted for supplementary use in the schools of CHICAGO, ILL., MINNEAPOLÍS, MINN., DULUTH, MINN., PEORIA. ILL., and many others of the best schools in all parts of the country. They have not only been introduced into the schools of the places above referred to, but they have everywhere been received with favor and have been accorded, by teachers and others, the most enthusiastic commendation.

School committees and others whose duty it is to select text-books for schools should see these Readers before adopting others. Copies for examination will be sent on receipt of the introduction price.

# HARPER & BROTHERS, Publishers,

Franklin Souare, NEW YORK.



"ENCYCLOPÆDIA BRITANNICA." Popular Reprint, \$2.50 per volume, 24 volumes, making the set complete, now ready for delivery. One-half the price of the Scribner & Stoddart editions, and less than one-third the price of the original English editions which we have reproduced in fac-simile texts, maps, plates and illustrations, same number of pages and same number of volumes.

Call and examine sets and compare with the other editions, all of which are in our office. Circulars and sample pages mailed.

"THE LITERARY MARVEL OF THE AGE."

## THE HENRY G. ALLEN COMPANY, PUBLISHERS, 739 and 741 Broadway, New York.

# Unfinished Worlds:

A STORY IN ASTRONOMY. By S. H. PARKES, F.R.A.S., F.L.S. With 9 Illustrative Diagrams. Price \$1.50, cloth.

"We have read this with profound interest. Mr. Parkes writes with a dignity and love of truth befitting so exalted a theme, with that glow of enthusiasm which a genuine student of the wonders of the heavens may be expected to feel."—Nonconformist.

"Mr. Parkes gives a deeply interesting account of the long series of experiments by Rev. Dr. Dallinger, which have a direct bearing on the late Mr. Darwin's theory of evolution, especially as it relates to the supposed transmutation of every elementary form of life into new and more advanced species."—N. B Daily Mail.

"No clearer or more readable book could be recommended. Excellent illustrative diagrams."—Glasgow Herald.

JAMES POTT & CO., Publishers, Astor Place, New York.

## Schools.

New Jersey, Plainfield.

THE CHESTNUTS.—Parents with daughters to educate, or orphan girls with companion, may find a comfortable home, with school instruction by applying to Miss E. E. Kenyon.

CONNECTICUT, NEW HAVEN,

M.R.S. CADY'S SCHOOL FOR YOUNG LADIES.

Prepares for Smith and Wellesley, and admits to Vassar by Certificate. Circulars. Early application necessary.

Vermont, Burlington.

VERMONT EPISCOPAL INSTITUTE. Boarding School for Boys. Prepares for College or Business. Military drill. Terms moderate. Fifty-seventh half-year opens September 3, 1888. Send for catalgue.

H. H. ROSS, A.M., Principal.

Publications received at Editor's Office, Feb. 25-March 2.

American Institute of Electrical Engineers, Transactions of the. Vol. V. New York, The Institute. 435 p.

GANGUILLET, E., and KUTTER, W. R. A General Formula for the Uniform Flow of Water in Rivers and other Channels. Tr. by R. Hering and J. C. Trautwine, Jr. New York, Wiley; London, E. & F. N. Spon. 240 p. 8°. \$4.

LAMARTINE, A. de. Jeanne d'Arc. Ed. by Albert Barrère. Boston, Heath. 188 p. 16°.

LAURIE, S. S. Occasional Addresses on Educational Subjects. Cambridge, Eng., University Pr. 215 p. 12°. (New York, Macmillan, \$1.25.)

MERRIMAN, M. A Treatise on Hydraulics. New York, Wiley. 36 p. 8°. \$3.50. GANGUILLET, E., and KUTTER, W. R. A General For-

Wiley, 38t p. 8°, \$3.50.

Thomson, W. Popular Lectures and Addresses. (Nature Series.) Vol. I. Constitution of Matter. London and New York, Macmillan. 460 p. 12°. \$2.

# GUARANTY INVESTMENT COMPANY

# CAPITAL \$250,000.

Hon. ALBERT H. HORTON (Chief Justice, Kansas Supreme Court), Topeka, Kan., Pres't.

# 7 Guaranteed Farm Mortgages 7

The Company calls the special attention of Investors to the following points:

- All loans guaranteed and interest payable semi-annually at the Importers' & Traders' National Bank, New York.
- II. Unusual fulness of information, not only about the security itself, but about the general development of the section where the farm is located.
- III. An examination each year of the general business of the Company and the Mortgages themselves by a COM-MITTEE OF INVESTORS sent for the purpose.
  - IV. Many hundred Mortgages taken and NOT A SINGLE FORECLOSURE.
- V. Exhibitions in New York at frequent intervals, of Kansas and Nebraska Farm Products. The Exhibition at the American Institute in the fall of 1888, received the HIGHEST AWARD of superiority.
  - VI. Monthly Bulletins giving full information about all Mortgages offered for sale.

Address for Monthly Bulletin and Investors' Committee Report for 1888,

# HENRY A. RILEY, General Eastern Manager, 191 Broadway, N.Y.

# THE CHEQUE BANK

LIMITED.

ESTABLISHED IN LONDON, 1872.

CHIEF OFFICE, 4 Waterloo Place, Pall Mall, London.

TRUSTEES:

The Right Honorable JOHN BRIGHT, M.P. The Right Honorable EARL BEAUCAMP. Bankers: Bank of England.

Bankers: Bank of England.

The Capital of the Bank and its Guarantee Fund of 59% is invested in Government Securities.

The Bank does not discount Notes or Bills, nor speculate, but loans its Deposits against Government Securities, thus making the Cheque Bank Cheques EQUAL TO CASH—as Bank of England Notes are.

The Cheque Bank issues Cheques singly or in books from ONE POUND upwards, for the use of Travelers, and for others remitting money to Europe, available in every town in England. Scotland, Ireland, and Wales. In every town of Europe, and all other parts of the world. Cheque Bank Cheques are accepted as Cash by all the British Government Offices.

VISITORS TO THE PARIS EXHIBITION this summer can get the Cheque Bank Cheques cashed at 50 Banking Houses in Paris.

Travelers and others holding Cheque Bank Cheques can have their mail matter addressed to them, care of the Cheque Bank, London, who will take charge of the same and forward to any address.

For Hand-Book containing List of upwards of 2000 of the principal Banking Houses throughout the World who Cash the Cheque Bank Cheques, and for all information, apply to the AGENCY,

## CHEQUE BANK, Limited,

UNITED BANK BUILDING,

2 Wall St., New York.

## E. J. Mathews & Co., Agents.

### REFERENCES BY PERMISSION:

JNO. W. MACKAY, Esq., President Commercial Cable Company, Mackay-Bennett Cables, New York.

F. O. FRENCH, Esq., President Manhattan Trust Co. New York, and others.

# $\mathsf{THE}$

COMPANY.

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30, 1877, No. 186,787.

The Transmission of Speech by all known forms of ELECTRIC SPEAKING TELEPHONES fringes the right secured to this Company by the above patents, and renders each individual user of telephones, not furnished by it or its licensees, responsible for such unlawful use, and all the consequences thereof and liable to suit therefor.



Brokers and Auctioneers.

# R. ELLIS &CO.

BUSINESS, HOTEL AND PATENT BROKERS, AUCTIONEERS, ETC.

No. 176 BROADWAY,

Room 46.

New York.

CLIENTS Advised free of charge.

# J. P. TRAVER & CO.,

General Auctioneers,

# Real Estate and Business Brokers.

OFFICE, 23 PARK ROW,

OPPOSITE POST OFFICE, (ROOMS 14 & 15.) New York.

Cash Advanced on Consignments. Mortgages Foreclosed. Property of Every Description Bought, Sold and Exchanged.

### Wants.

YOUNG MAN can have lucrative engage-A ment, not only a fixed salary, but according to his work accomplished in travelling for SCIENCE. A personal interview invited.

N. D. C. HODGES,

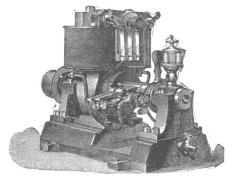
47 Lafayette Place, New York.

# C. & C. ELECTRIC MOTOR COMPAN

Electric Motors

Arc and ncandescent Circuits, Most Economical Motor on the Market.

Regulation Perfect. Motors Designed for all Power Purposes.



**OFFICE and MANUFACTORY:** 402 and 404 Greenwich Street, New York City.

New England Office, 19 Pearl St., Boston.

Philadelphia Office, 301 Arch St.

Western Office, 139-141 Adams Street Chicago.

Southern Office, 25 Carondelet Street, New Orleans,

ESTABLISHED 1859.

Commercial Printer, 5 Clinton Place, near Broadway, New York.

Wedding Orders, Souvenirs, Invitations, Orders of Dance, etc., etc., done in the latest and most elaborate styles, at reasonable prices.

All Favors promptly attended to.

### PACES. THREE PACES.

Hundred Thousand new subscribers for The Family Journal and Ladies' Companion wanted. It is the most interesting and instructive paper ever issued Subscribers will receive during the coming twelve

# MONTHS

novels written by American Authors, complete in each three numbers. The story of popular works of fiction will be retold by a novel reader, the most interesting and unique feature ever introduced in any publication, giving the substance of popular and standard books by famous writers in a space easily read by the busiest people. We have engaged

## FOR

this work a widely known and popular writer. Comments on Current Events, Fashions, New and Original Ideas and Designs for Ladies' Fancy Work and Household Decoration, Letters from Correspondents and their Answers. The colleges and seminaries of the United States will be treated one each month in an illustrated article, showing the particular advantage of each, cost of attendance, etc. Invaluable to parents having sone or daughters whom they desire should receive the advantages of a higher education than the ordinary school affords. Articles on Painting and Drawing, giving home instruction by a well-known artist. A trial subscription of this elegant paper will be sent to any address, three months, for

## TEN CENTS.

Liberal pay for literary work adapted to our columns, and for new and original drawings, designs and ideas on any subject which we can use.

Premium List the most complete in the world. We offer inducements to club raisers and agents approached by no other publishing house. The celebrated Gilbert Cut Waist Linings, which we send post paid to any one sending us two yearly subscribers at 50 cents each is alone worth 75 cents.

Sent to any address, post paid one year, 50 cents; six months, 25 cents, and a three months' trial subscription for only 10 cents.

## TRY IT! TRY IT! TRY IT!

and you will become a permanent reader. Address:

John L. Douglass, Publisher, 322 Broadway, N. Y.



## **GOOD NEWS** TO LADIES.

Greatest inducements ever of-fered. Now's your time to get up orders for our celebrated Tens and Coffees, and secure a beautiful Gold Band or Moss Rose China Tea Set, Dinner Set, Rose Toilet Set, Watch, Brass Lamp, fionary. For full particulars address

or Webster's Dictionary. For full particulars addre THE GREAT AMERICAN TEA (O., P. O. Box 289. 31 and 33 Vesey St., New York.

Scientific Apparatus.



Established 1852.

Microscope Stands, Oil Immersion Objectives and Abbe Condensers for Bacterial and Histological work, of Objectives, Camera Lucida and other accessory apparatus.



# R. & J. BECK, 1016 Chestnut Street Phila

Microscopes and all Accessories and Apparatus. Photographic and Photo-Micrographic Apparatus and Outfits.

W. H. WALMSLEY & CO. SUCCESSORS TO

Spectacles, Eye
Glasses, Opera and
Marine Glasses, etc.
Illustrated Price List

mailed free to any address. Mention SCIENCE in corresponding with us





E. & H. T. ANTHONY & CO. 591 Broadway, N.Y. Manufacturers and Importers of PHOTOGRAPHIC INSTRUMENTS,

Apparatus and Supplies of every description. Sole proprietors of the Patent Detective, Fairy, Novel, and Bicycle Cameras, and the Celebrated Stanley Dry Plates.

Amateur Outfits in great variety, from \$9.00 upward. Send for Catalogue or call and examine. More than 40 years established in this line of business.

WHITALL'S PLANISPHERES OR DIRECTORY OF THE STARRY HEAVENS name and locate all Stars, Constellations, and Planets visible at any given minute of time. Should be used by every one. Ask your stationer, or address WM. T. COOPER, Manager, 307 Race St., Philadelphia, Pa.

### SCHOOLS AND COLLEGES

will have a positive advantage by ordering their furniture apparatus and supplies from C. PARDO & CO., 31 East 17th St., New York.

# ELECTRICAL TESTING BUREAU.

IMPROVED OIL LIGHT

MAGIC LANTERNS.

Also Lime and Electric Light Apparatus, and mechanical, plain, and fine colored views. J. B. COLT & CO., Manufacturers,

No. 16 BEEKMAN STREET, NEW YORK.

MAGIC
LANTERNS
Tatus, new views. Largest stock. Reduced prices. 24
Years' Practical Experience. Illus. Catalogue Free.

GEO. H. PIERCE, 136 S. Eleventh St., Philadelphia, Pa

Johns Hopkins University, Baltimore, Md.

Resistance Coils and Boxes Compared. Am meters and Volt meters calibrated. Condensers standardized.

Primary and Secondary Batteries Tested. Efficiency of Dynamos and Motors Deter-

Insulation of Cables and Wires Tested. Etc., Etc.

Circulars describing Methods Used, Prices, Etc., sent on Application.

Address as above.

### EMPLOYERS. T0

Having purchased the fixtures, good will, &c., of the NEW YORK EMPLOYMENT BUREAU, at No. 681 BROADWAY, in this city, we request the patronage of the public in the future. We desire to fill a long-felt want for an employment bureau, where only the best grade of male help is dealt in, and it is our aim to send ONLY such help as is ordered in every instance, and our patrons can rely on us to send strictly first-class help, the references of whom we personally investigate before sending to any one. We simply request a trial, and are convinced that we will give satisfaction in every case. We have on hand help in every branch, which we can send upon receipt of telegram or letter, AND FOR WHICH WE MAKE NO CHARGE TO AN EMPLOYER.

## NEW YORK EMPLOYMENT BUREAU.

(AS REORGANIZED).

ps.su, and of the complete sets for \$5.00 and 50 cents for postage and registering, or to any one ordering \$5.00 worth of the above packets at one time, a \$1.00 packet will be sent free.

# Hrnold. Constable R Co. UPHOLSTERY.

**NEW FABRICS** 

For Furniture, Curtains and Decorations.

Ardmures and Arras Brocades. TAFESTRIES AND GOBELINS.

"Flemish" plain and figured Galorine. SILK AND COTTON PRINT STUFFS For Wall and Interior Decoration.

Broadway K 19th st.

# DRESS GOODS FOR SPRING

We are now exhibiting our Novelties in Dress Goods for Spring and Summer.

An extensive variety of fine wool and silk mixed fabrics, in new shades; Summer Tweeds, with handsome selvages; French Cheviots with Shepherd Check side band; and many other new styles.

Advance styles in Figured Challie; India Silk in Exclusive designs; Mohair, Brilliantine and Pongee Gloriosa in a fine range of

# JAMES McCREERY & CO.

BROADWAY AND ELEVENTH STREET,

NEW YORK.

# SPECIAL TEACHER'S EXCURSION TO ANIO WORLD'S EXPOSITION,

visiting England, France, Germany, the Rhine, Belgium and Holland. All travel and hotels FIRST-CLASS Finest line of Steamers crossing the Atlantic. Low Rates, Rooms are being rapidly taken. Send for circular, free. E. TOURJEE, Franklin Square, Boston, Mass.

# F00DADULTERATION

And its Detection. With photomicrographic plates and a bibliographical appendix. By J. P. Battershall. 328 pages, 8vo, cloth. Price, \$3.50. Circulars and Catalogues E. & F. N. SPON, on application.

12 Cortlandt St., New York.

NEW MAGAZINE—THE SWISS
Devoted to spreading a love of CROSS
by HARLAN H. BALLARD, President of the Agassiz Association, and succeeding \$t\$. Nichol \$t\$ as the official magazine of that body. \$1.50 a year. Sample copy locents, or 25 cents for trial subscription for 3 months.

Mention this paper.

NEW MAGAZINE—THE SWISS
Fifteen First Prize Medals.
WM. S. KIMBALL & CO.,
Rochester. N.Y.

Readers of Science

Corresponding with or visiting Advertisers
will confer a great favor by mentioning the paper.

# We will send a complete set of the first six packages for \$3.50, and of the complete sets for \$5.00 and 50 cents for



versary, which will he selected with care for different tastes and ages as specified.

TO TEACHERS ONLY

50 Marcus Ward's, Prang's, and other beautiful Cards, no two alike, for \$1.00 and 8 cents for Postage. Better assortment, \$2.00 and 10 cents for Postage. A very choice selection, no two alike, \$3.00 and 20 cents for Postage and Registering. And for 50 cents, and 4 cents for Postage, 25 Cards, no two alike, and a Calendar for 1889.

LOWEST PRICES IN THE UNITED STATES.

PAPER BY THE POUND. (no better or more elegant paper can be made), Commonwealth Linen (a good medium priced linen paper), U. S. Treasury Bond (a tough paper, and very fashionable). Selling directly from mills to the consumer, we are able always to give lowest possible prices. Sample sheets of paper and envelopes, with prices and number of sheets to a pound, sent on receipt of 15 cents, and special prices to those taking orders for these papers with our card packets.

H. H. CARTER & CO., NO. 3 BEACON ST. BOSTON, MASS.

Old and Rare Books.

## CLARK, Bookseller,

34 PARK ROW, NEW YORK CITY.

A Gleaner in the By-ways of Literature. Results of Gleaning found in Catalogues issued from time to time.

CATALOGUE NO. 27 NOW READY.

BACK NUMBERS and complete sets of leading Magazines. Rates low. AM. MAG. EXCHANGE, azines. Rates low. Schoharie, N.Y.

H. WILLIAMS,

Dealer in Old Magazines, Reviews, &c. Scientific 39 Macdougal St., N.Y. periodicals a specialty.



PIANOFORTES. UNEQALLED IN

Tone, Touch, Workmanship and Durability.

WILLIAM KNABE & CO.
NEW YORK: No. 112 Fifth Av., above 16th 6t.
BALTIMORE: Nos. 22 and 24 E. Baltimore St.
WASHINGTON: No. 817 Market Space, Penn. Av., near 9th St.



### KIMBALL'S STRAIGHT **CIGARETTES**

Unsurpassed in quality.
Used by people of refined taste.
Highest award at Brussels, 1888.
The finest smoking mixtures are of The finest smoking — ur manufacture. Fifireen First Prize Medals. WM. S. KIMBALL & CO., Rochester, N.Y.

# **CSTERBROOK'S** STEEL PENS.

OF SUPERIOR AND STANDARD QUALITY. Leading Nos.: 048, 14, 130, 135, 239, 333 For Sale by all Stationers.

THE ESTERBROOK STEEL PEN CO.. Works: Camden, N. J. 26 John St., New York.

# WHY YOU SHOULD USE

or Cod Liver Oil water HYPOPHOSPHITES.

It is used and endorsed by Physicians because it is the best.

It is Palatable as Milk.

It is three times as efficacious as plain Cod Liver Oil.

It is far superior to all other so-called Emulsions.

It is a perfect Emulsion, does not separate or change.

It is wonderful as a flesh producer.

It is the best remedy for Consumption, Scrofula, Bronchitis, Wasting Diseases, Chronic Coughs and Colds.

Sold by all Druggists.

SCOTT & BOWNE, Chemists, N.Y.